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ABSTRACT

This unit is designed for secondary school students. It is concerned with the concept of the marsh and includes activities related to the importance of the marshes; the aesthetic, recreational, and economic roles of marshes; the marsh food web; man's impact on marshes; and how to preserve marshes. Materials in the unit include evaluation materials, narration materials for 35 mm slides related to a marsh, transparency masters, and selected references. (BH)

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MARSHES: NATURE'S BOUNTY

A Learning Experience for
Coastal and Oceanic
Awareness Studies

Produced by

MARINE ENVIRONMENT CURRICULUM STUDY
MARINE ADVISORY SERVICE
UNIVERSITY OF DELAWARE

and

POPULATION-ENVIRONMENT CURRICULUM STUDY
COLLEGE OF EDUCATION
UNIVERSITY OF DELAWARE

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Please send evaluations

of learning experiences

to

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COAST Project

310 Willard Hall Education Building

University of Delaware

Newark, Delaware 19711

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TITLE: MARSHES: NATURE'S BOUNTY

*CONCEPT: VI.A.3.a.

VI. By planning within the natural system, a life of acceptable quality can be provided for all people.

A. Individual values and life styles can be compatible with a permanently hospitable and beautiful planet.

3. Individual concern can lead to the enhancement of of the esthetic qualities of the environment.

a. RESPECT FOR THE NATURAL SYSTEM COULD ENSURE THE SURVIVAL OF NATURAL AREAS.

**MARINE CONCEPT: 4.

4. MAN IS PART OF THE MARINE ECOSYSTEM.

GRADE LEVEL: 7-10

SUBJECT: General Science, Biology

CLASS PERIODS: 1

AUTHOR: Bathon

* From A Conceptual Scheme for Population-Environment Studies, 1973. Cost $2.50.
** From Marine Environment Proposed Conceptual Scheme, 1973. No charge.
Both conceptual schemes are available from Robert W. Stegner, Population-Environment Curriculum Study, 310 Willard Hall, University of Delaware, Newark, DE 19711.

INSTRUCTIONAL OBJECTIVES

At the conclusion of this unit, the student will be able to:

1. Define a marsh.
2. Discuss the importance of a marsh.
3. Discuss the aesthetic, recreational and economic roles of marshes.
4. Describe the marsh food web.
5. Discuss how man can destroy marshes.
6. Discuss what steps can be taken to preserve marshes.

PROCEDURE

1. Give the pre-test. It should take approximately ten minutes and should show how much the students already know about marshes.

2. Give the slide presentation. You will need a 35 mm slide projector, an overhead projector for transparencies, and a screen.

   For a more effective and smoother presentation, rehearse the narrative beforehand. Discussion questions are contained throughout the narrative with possible answers provided in italics. Portions of the answers not given by the students in the course of the discussion should be added by the teacher. Since there is a large amount of information conveyed during this lesson, it may be helpful to write key points on the blackboard.

3. As a supplement to the slide presentation described here, you may wish to use some slides from the "Marine Organism Slide Collection," available from Population-Environment Curriculum Study, 310 Willard Hall, University of Delaware, Newark, DE 19711. The following slides could be used:

   Slide 258 Blue Crab (with narration on p. 6, paragraph 3)

   Slide 239 Oyster (with narration on p. 6, paragraph 3)

   Slide 255 Hermit crab (with narration on p. 6, paragraph 4)

4. Give the post-test, p. 15 . The post-test should last approximately twenty minutes. The questions could be rewritten to suit the appropriate grade level.

PRE-TEST

1. What is a marsh?

The dictionary defines a marsh as a tract of soft, wet land.

2. If you visited a marsh, what types of animal life might you find?

Beavers, minks, raccoons, muskrats, ducks, geese, shellfish, fish, etc.

3. What types of plant life would you find in a marsh?

Cattails, cord grass (Spartina) and giant reed (Phragmites)

4. What contributions do marshes make to man?

They provide him with food, water for livestock, assistance with flood control, and recreational and educational activities.

5. What contributions do marshes make to animal life?

The provide food, shelter, and and an environment conducive to breeding.

SLIDE PRESENTATION

Narration	Slides
What is a marsh?	167 Marsh
The dictionary tells us that a marsh is a tract of soft, wet land.	
But a study of marshes will reveal that a marsh is much more valuable than that simple definition would lead us to believe.	
Marshes have too often been considered wastelands of mud and water, unfit for farming or residential development in its natural state.	
But a marsh in its natural state contributes a great deal to any area. A marsh has many different uses.	
What uses of marshlands are familiar to you?	
(The plant life is used for hay; some forms of animal life of the marsh such as scallops, oysters, clams, and fish are used for food; other forms of animal life of the marsh such as raccoons and minks are used for fur; the water of the marsh is used for irrigation and livestock watering. Marshes provide opportunities for many recreational and educational activities.)	
Marshes may contain salt water, fresh water, or both.	
In times of drought or emergencies, marsh water may increase in importance.	
In what ways can marsh water be used during times of emergency?	
(Marsh water could be used for irrigation, fire prevention, or even human consumption.)	
Some marshes even provide nourishment for livestock.	168 Livestock watering
The regulation of stream flow, and thus the prevention of floods, is another important function of marshes.	169 Marsh

How do marshes prevent floods?

(They provide areas for the storage of excess water and a mechanism for the slow release of such excess water.)

In addition to flood regulation, marshes increase the quality of groundwater and help keep the water table high. (A water table is a natural underground reservoir of water.)

Marshes also provide a habitat for waterfowl, wildlife, and vegetation. 170 Waterfowl

Diatoms and related phytoplankton flourish in marsh water. 171 Diatoms and other phytoplankton

Why are diatoms and related phytoplankton important to marine life?

(These organisms comprise part of the base of the marine food chain. Many forms of life depend on them.)

Thus, another important function of the marsh is that it provides a part of the base of the marine food chain.

This high nutrient content of the marsh permits plants and animals to flourish also.

Why do our coastal fisheries depend on tidal marshes? 172 Small fish

(Fish come into bays and marsh areas to breed. Because the base organisms of a food chain are abundant in marshes, marshes serve as a nursery ground by providing food for the young fish. The marsh also provides the young fish with protection from many of their predators.)

From the tidal marsh, algae, small pieces of decaying plant matter known as detritus, and other nutrients are washed out with the tide and nourish crabs, oysters, mud snails, tiny shrimp-like crustraceans, and small fish, all of which serve as food for larger fish. 173 Mud snail

Turtles may also be seen in a marsh.

Fiddler crabs are also abundant in the marsh. 174 Fiddler crab

The fiddler crab emerges from its burrow at low tide to forage in the detritus left behind by the retreating water.

The male fiddler crab is identified by his large claw. The violin-like motion of this claw at mating time gives the fiddler crab its name.

The blue crab, named for the coloration of its legs, enters the marsh food web by feeding on small oysters and dead and decaying animal matter.

The hermit crab does not have a protective shell and must utilize snail shells for its protection.

In addition to a wide variety of animal forms, the marsh also has many different kinds of plants, all of which help anchor the soil.

Cattails may provide nesting places for birds.

175 Cattails

Spartina is the most common of salt-marsh grasses. Its common name is cord grass.

176 Spartina

Phragmites, or giant reed, is abundant along the borders of both freshwater and salt water marshes.

177 Phragmites

When dead, Phragmites may be compressed naturally to form a solid mat which lines the edge of the marsh and prevents erosion.

What other types of marine animal life could be found in salt water tidal marshes?

(Barnacles, scallops, sponges, jellyfish, crabs, oysters, mud snails, etc.)

Sponges and scallops live on the bottom of tidal creeks running through marshes and may be harvested there.

178 Red beard sponge
179 Bay scallops

Barnacles, which feed on plankton and detritus, may be found attached to hard surfaces in marshes.

The middle of the intertidal region, which is alternately covered and uncovered by the tides, is known as the barnacle zone.

The wildlife in the marshes is as varied as it is abundant. 180 Wildlife

What conditions in the marsh make it a good habitat for waterfowl?

(A marsh may provide both the shelter and food waterfowl require, all within favorable climatic conditions.)

Many ducks find winter homes in the marsh, but only a few nest there.

The Canada goose uses marshes during its migration and has become a symbol of approaching winter. 181 Geese

Mallard and black ducks spend the winter in harbors and tidal creeks. 182 Mallard duck

When spring approaches, they mate and build nests around the edges of the marsh.

Gulls forage along coasts, picking their food from garbage dumped in coastal waters or by turning up worms, crustaceans, and shellfish.

Rails are marsh birds that fly and swim somewhat awkwardly. 183 Rail

They have narrow, compressed bodies so they can slip through thick moist grass easily.

Their slenderness originally evoked the phrase "thin as a rail."

What mammals might be found in a marsh?

(Mink, beavers, racoons, and muskrats.)

Which mammal has visited this tree? 184 Tree with evidence that a beaver has recently visited it.

(A beaver)

Indications of the presence of a beaver may be visible by the remains of trees and shrubs they have used to build their homes and dams. 185 Beaver lodge
186 Beaver dam

The muskrat, related to the beaver, also gathers vegetation and builds a lodge in which to spend the winter.

187 Evidence of muskrat cutting

This is a muskrat lodge.

188 Muskrat burrow entrance

How does this muskrat lodge differ from the beaver lodge?

(The difference is in the composition of the lodges. Beavers use much larger material.)

Muskrat lodges vary in size.

Some of the biggest have been ten feet in diameter and four feet high.

The smallest have been barely larger than a bushel basket.

In warm weather muskrats forage for marsh plants and mussels or other invertebrates.

In the marshes there is evidence of immense production of both vegetation and animal life.

This is a food chain diagram.

Show transparency of the food chain, p. 12.

What is a food chain?

(A food chain is the route through which energy, in the form of food, is passed from one form of organism to another. Energy is essential for the organisms' growth, maintenance and reproduction.)

Let's construct a food chain for life in the marsh.

(A number of relationships exist. Generally, diatoms and related phytoplankton and zooplankton are consumed by larger living forms such as barnacles and mud snails. Detritus provides nourishment for some shellfish and crustaceans, which are eaten by gulls and other forms of wildlife. Small fish, which eat small forms of marine life, are eaten by larger fish and waterfowl. Waterfowl may also eat marsh plant life. Man is part of the marsh food chain because he consumes waterfowl, fish, and shellfish.)

Most food (energy) relationships are not as simple as the food chain. This diagram shows how the several food chains of the marsh interconnect to form what is known as the food web.

Show transparency of salt marsh food web, p. 13.

Notice that many animals in the food web rely on more than one type of food.

Can you pick out some of the simple food chains? *(The student should follow the arrows through any one of the pathways shown.)*

Left to itself, a marsh is a complete ecosystem of food chains, climatic adaptations, and biological balance.

When man enters a marsh, his reason for doing so determines the nature of the changes he causes there.

What recreational activites might be enjoyed by man in the marsh?

(Trapping, hunting, fisning, and clamming.)

Muskrat trapping and duck hunting are two forms of recreation.

189 Ducks

Oysters, crabs and clams may spend their entire life cycles in a particular type of marsh where they may be sought be sportsmen.

Biologically, such recreational activities are in keeping with man's position in the tide marsh.

Man may seek the marshes for aesthetic reasons--just to view the marshes natural beauty.

190 Flourishing marsh

To share, not break the silence...

To become a part of the solitude.

In the words of Henry David Thoreau
"We need the tonic of wilderness."

But one man may destroy what another man seeks.

Although marshes are occasionally destroyed by natural forces such as storms and a rising sea level, marshes are being destroyed by man.

In fact, the 127 million acres of marshes, bogs, and swamps existing in 1940 had been reduced to about 74 million acres by 1966.

191 Birds feeding in marsh area

What has caused this destruction?

(Man has destroyed marshes by dredging them to obtain landfill material and to make waterways or by filling them to build homes and highways. Industrial and urban pollution may also pollute the marshes so severely, they cannot function in their normal manner.)

Industrial and urban development often destroys a marsh, either through alterations of the physical features by dredging or filling or through the addition of municipal and industrial wastes to the marsh water.

192 Industry near marsh

How would chemical pollution affect a marsh?

193 Polluted marsh water

(It would destroy plant and animal life, either through the deadly nature of the chemical itself, or through the reduction in the amount of oxygen available by bacterial action.)

How would thermal pollution affect a marsh?

(A rapid rise in temperature would kill some of the marsh organisms. The sudden death of some organisms would upset the food web and affect many other organisms.)

Some good farmland has been provided by draining marshes.

At Bombay Hook, a national wildlife refuge in Delaware, farmers use portions of their recently drained land to grow grain to feed the fowl of the adjoining marsh.

194 Reclaiming farmland at Bombay Hook.

But tidal marshes themselves are among the most productive lands in the world.

They can be four times more productive in plant growth than a good cornfield.

Keeping in mind the functions of marshes discussed earlier, what may be some of the effects of draining marshes?

(Draining the marshes may lower the water table, contribute to increased flooding, destroy wildlife winter and breeding grounds, and alter or destroy the life which forms the base of the marsh food web.)

The disadvantages of altering the marshlands are evident to many concerned persons.

Areas residents of Tinicum Marsh in Pennsylvania have organized a group in hopes of preserving the marsh.

One of the reasons the group feels marsh preservation is important is that the marsh can act as a natural sewage treatment system. Marsh organisms are capable of removing ammonia and phosphates from wastewater and adding oxygen.

At Tinicum and Bombay Hook, naturalists have provided "homes" for the nesting ducks to protect the eggs from raccoons.

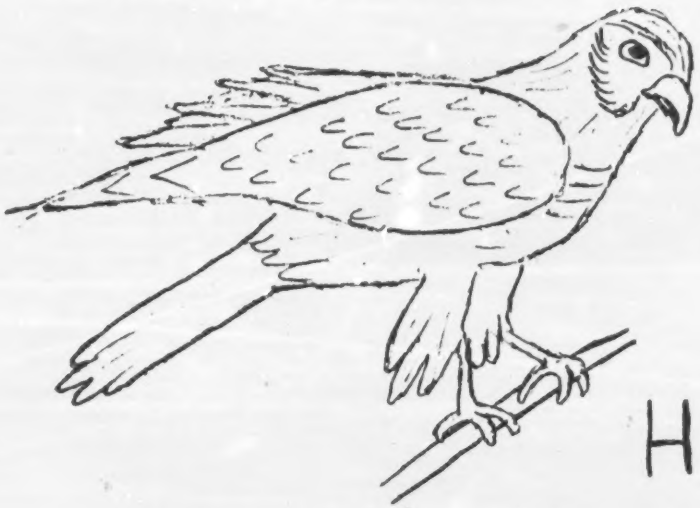
195 Duck nesting box

Many people, even avid fishermen and duck hunters, do not realize the importance of marshlands.

Marshes must be preserved to serve as habitats, shelters, and breeding grounds for a great abundance and variety of plant and animal life.

FOOD CHAIN

GRASS



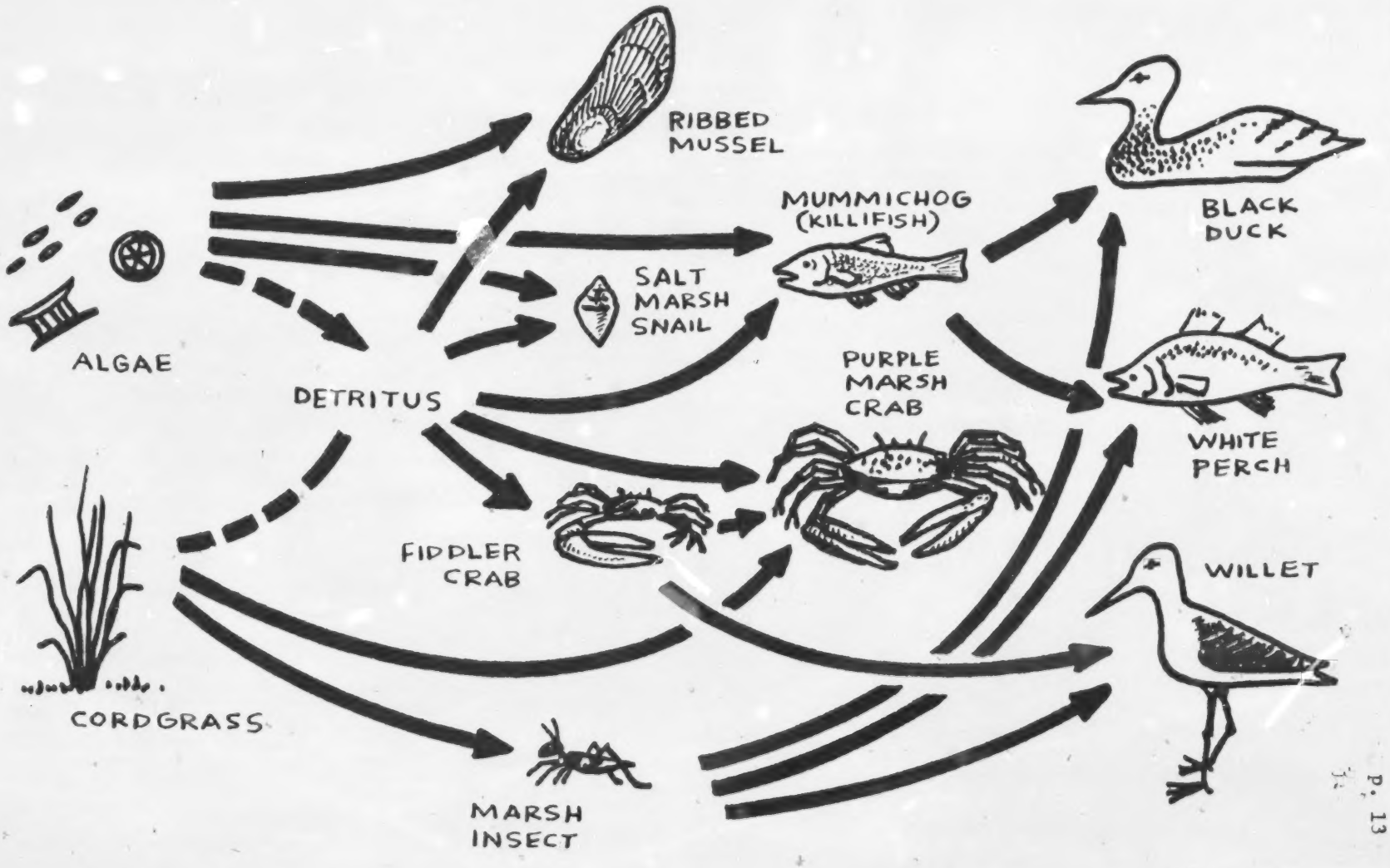
HAWK

MOUSE

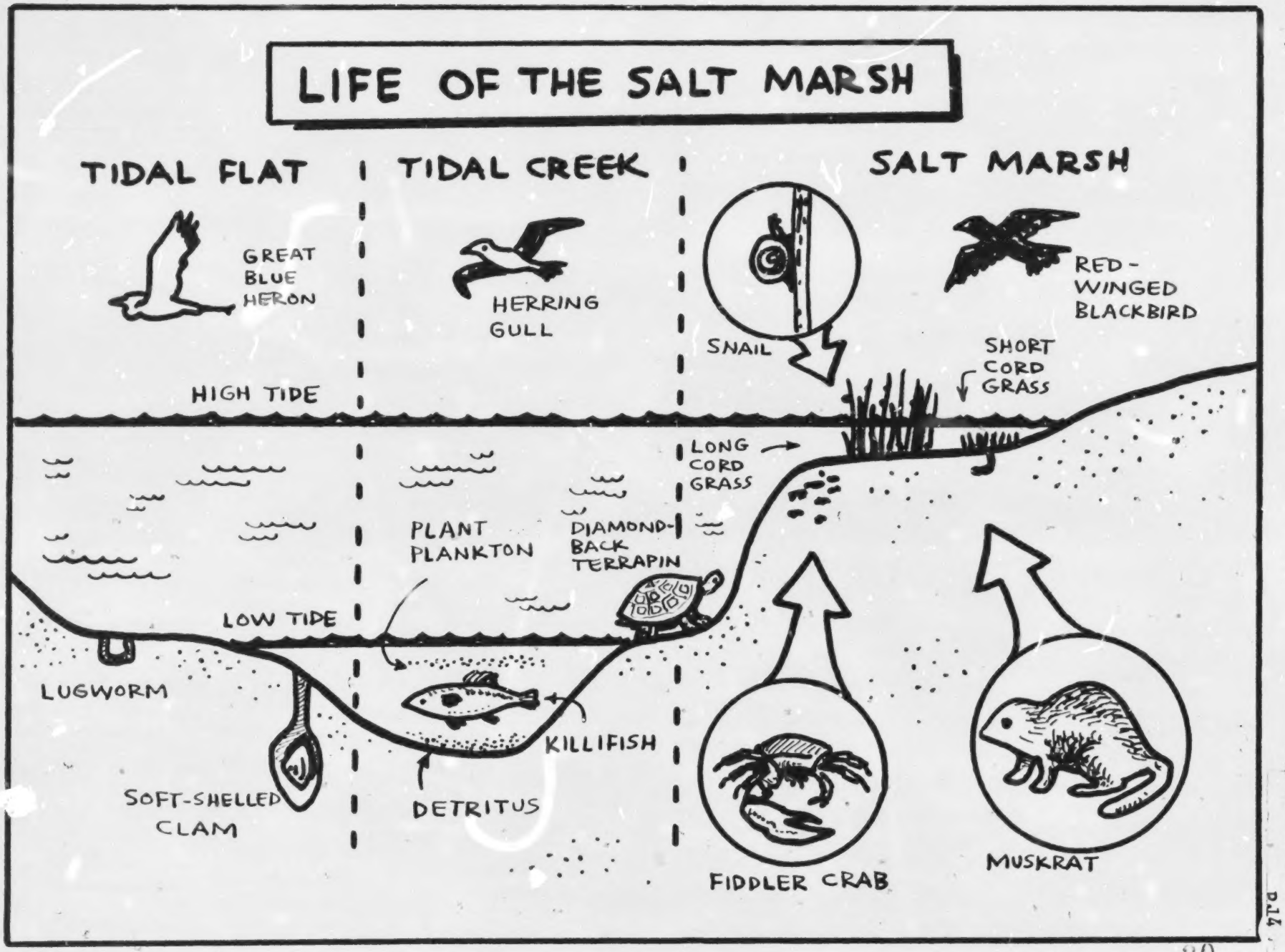
SNAKE

VI.A.3.a.
(Mar.4)
p. 12

SALT MARSH FOOD WEB



P. 13


LIFE OF THE SALT MARSH
TIDAL FLAT
TIDAL CREEK
SALT MARSH
GREAT BLUE HERON
HERRING GULL
SNAIL
RED-WINGED BLACKBIRD
SHORT CORD GRASS
HIGH TIDE
LONG CORD GRASS
PLANT PLANKTON
DIAMOND-BACK TERRAPIN
LOW TIDE
LUGWORM
KILLIFISH
SOFT-SHELLED CLAM
DETRITUS
FIDDLER CRAB
MUSKRAT

POST-TEST

1. Describe the food chains found in a marsh. You may use a diagram if you wish.

2. How are marshes destroyed?

3. What is being done to preserve the marshlands?

4. What types of animal and plant life may be found in the marsh?

5. In what ways are marshes important?

POST-TEST ANSWERS

1. Diatoms and related phytoplankton and zooplankton are consumed by larger organisms such as barnacles and mud snails. Detritus provides nourishment for shellfish and crustaceans which are eaten by gulls and other forms or wildlife. Small fish, which eat smaller forms of marine life, are eaten by larger fish and wildfowl. Waterfowl may also eat marsh plant life. Man is part of the marsh food chain because he consumes fish, shellfish, and waterfowl.

2. Storms, a rise in sea level, dredging, filling, pollution

3. Marshland is being set aside as wildlife preserves and concerned groups are taking legal action to prevent pollution of marshes. Public education programs have also been established to increase awareness of the value of the marshes.

4. Mammals--beavers, raccoons, minks, and muskrats
   Waterfowl--geese, gulls, mallards, rails
   Fish
   Shellfish--oysters, clams
   Crabs--fiddler crab, blue crab

   Plant life--phytoplankton, algae, and marsh grasses (cattails, Spartina, and Phragmites.)

5. Marshes are important in the regulation of flooding, the establishment of high water tables, and the provision of water in times of emergency. Marshes are important as nursery grounds and winter stopping points for many forms of waterfowl and marine life. The abundance of life in the marsh not only plays a significant role in the food web, but also provides aesthetic and recreational opportunities for man.

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